Implementing less invasive surfactant administration on a neonatal unit

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► Additional material is published online only. To view, please visit the journal online (http://dx.doi.org/10.1136/edpract-2020-320574).

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Received 30 August 2020
Revised 11 March 2021
Accepted 14 March 2021
Published Online First 8 April 2021

To cite: Williamson SL, McDermott H, Gowda H. *Arch Dis Child Educ Pract Ed* 2022;**107**:298–301.

ABSTRACT

There is increasing evidence reflected in both UK 2019 NICE and European guidelines suggesting that less invasive surfactant administration (LISA) reduces the need for mechanical ventilation and reduces the combined outcome of death or bronchopulmonary dysplasia, and is now the optimal method for surfactant delivery in spontaneously breathing babies. Despite this, uptake in England has been slow compared with Europe. This quality improvement project outlines the process of implementing LISA in a neonatal intensive care unit over a 2-year period, the barriers and challenges which were encountered, and how they were overcome.

SUMMARY

Less invasive surfactant administration (LISA) is a method of administering surfactant using tracheal catheterisation in infants with respiratory distress syndrome. Surfactant administration improves clinical outcome and is needed in the majority of babies born <33 weeks' gestation.[1 2]

Increasing evidence, reflected in both UK 2019 NICE and European guidelines, suggests that LISA reduces the need for mechanical ventilation and reduces the combined outcomes of death or bronchopulmonary dysplasia (BPD) and is now the optimal method for surfactant delivery in spontaneously breathing babies.[3–5]

PROBLEM

The uptake of LISA in England has been slow compared with Europe.[6 7] Identified barriers include lack of familiarity with the procedure, perceived lack of benefit when compared with more well-known methods and concerns over procedure-associated discomfort.[8]

While the technique is widely known, it is still being introduced into regular practice and, in beginning of 2018, was not used on our unit due to the aforementioned barriers plus lack of specific equipment.

AIMS

To safely introduce LISA as a standard method for surfactant administration for suitable babies on a neonatal intensive care unit in the UK, which cares for babies ≥22 weeks' gestation, by June 2020.

MAKING A CASE FOR CHANGE

We engaged local stakeholders (clinicians, nurses, individuals involved in the procurement pathway, governance department) to canvas opinion and discuss barriers to change. We liaised with neonatal units regularly performing LISA to obtain advice and guidance and involved relevant companies manufacturing specific equipment. Following this, we wrote a guideline which was reviewed and agreed by the consultant team and disseminated to the wider neonatal team via regular educational sessions.

YOUR IMPROVEMENTS

We commenced the project in early 2018, staff attended teaching sessions and participated in simulated scenarios prior to implementation. All babies receiving LISA over the next 2 years (June 2018–June 2020) were audited. Data were collected retrospectively using case notes and BadgerNet electronic record system.

Multiple challenges were identified throughout the process and addressed (figure 1).

We based our practice on the Hobart method of tracheal catheterisation[9] with a specific guidable, semi-rigid catheter (LISAcath; Chiesi Farmaceutici S.p.A.). The surfactant is given slowly over 3–5 min via the LISAcath to a spontaneously breathing baby, causing surfactant diffusion throughout the lungs. To

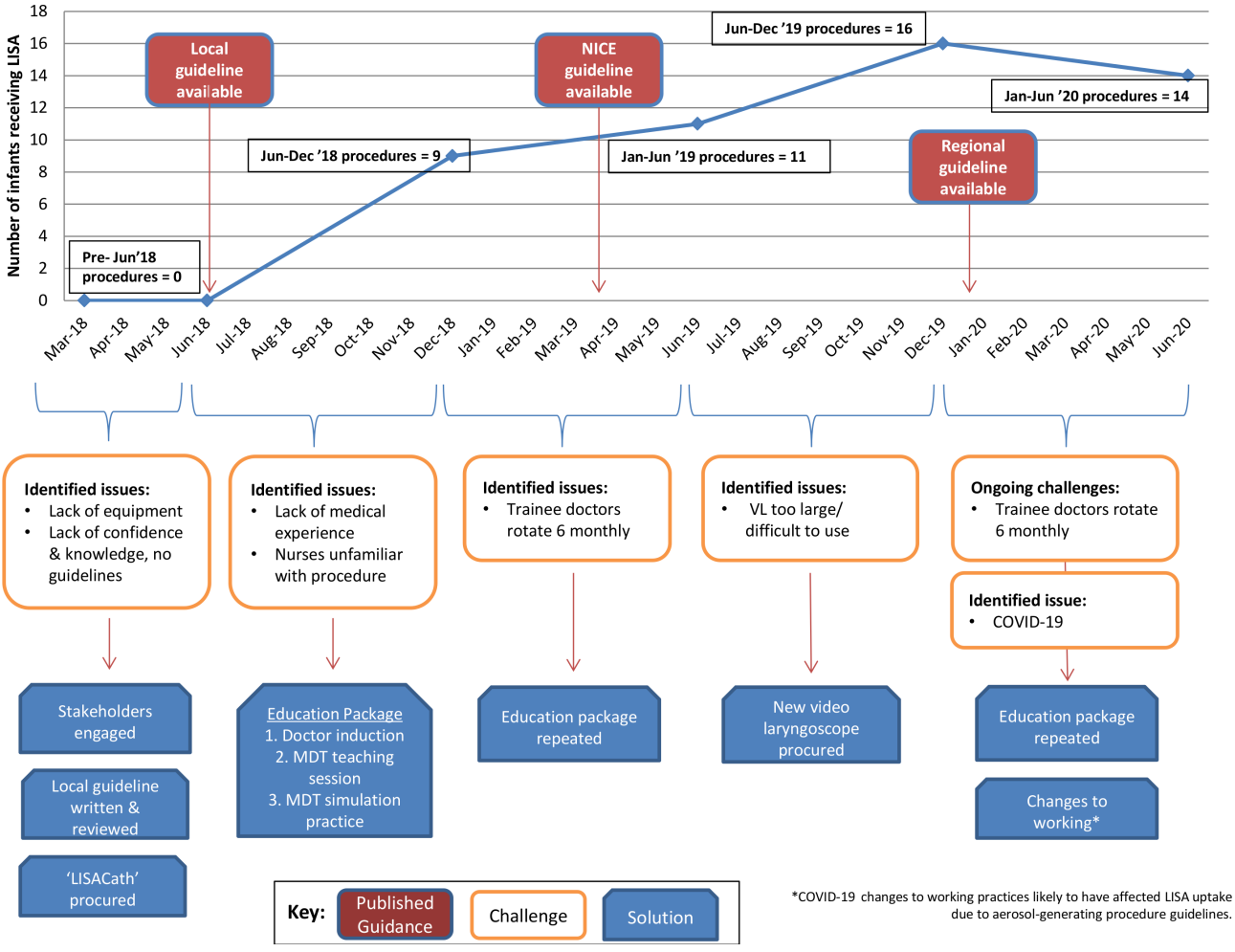

Figure 1 Run diaphragm depicting the implementation of less invasive surfactant administration (LISA). MDT, multidisciplinary team; VL, video laryngoscope.

confirm placement of the catheter through the vocal cords, the use of a video laryngoscope (VL) is gold standard. Following difficulties with existing equipment, we procured a new VL. This technology has also facilitated supervision of junior colleagues, finding that once trained, any member of the medical team can perform LISA successfully (table 1). Similar to other studies, we have found that use of the VL requires regular, specific training, as the view is different to that of a standard laryngoscope.[10]

In response to challenges encountered, we adapted our technique. Using a T-piece extension kit attached to the LISAcath, usually used for flushing an intravenous cannula enabled the assistant to deliver the surfactant at a comfortable distance from the operator (figure 2).

Understanding how the procedure works as a multidisciplinary team is essential. We achieved this through education and multidisciplinary simulation. Listening to our colleagues' concerns, we understood that being confident the baby is not experiencing pain during the procedure is a priority. Allocating a team member to provide non-pharmaceutical comfort care was then done routinely and pre-medication was used if deemed necessary by the most senior clinician present, based on how vigorous the baby appeared, has helped alleviate these concerns.

Patient characteristics and outcomes from the 50 individual babies who have received LISA can be found in table 1.

A major limitation of this method was that the data were collected retrospectively. While no serious adverse events were observed, minor adverse events could have been under-reported from documentation. It also means that defining numerical limits of desaturation and bradycardia were difficult to assess. One baby was noted to have a pneumomediastinum post-LISA on radiograph; however, no imaging was done prior to the procedure.

LEARNING AND NEXT STEPS

Key learning points

- Multidisciplinary learning and simulated practice is essential in implementing change.
- LISA can be performed safely and by any member of the medical team, provided supervision by someone with airway expertise is available.

Table 1 Patient characteristics and outcomes of infants who received LISA

Total babies	n=50
Median gestation, weeks (range)	31 (25–37)
Median birth weight, g (range)	1490 (620–3840)
Gender	
Male	29 (58%)
Female	21 (42%)
Median age at time of procedure (range)	6.5 hours (0–51)
Type of respiratory support prior to LISA	
High flow	44 (88%)
Continuous positive airway pressure	5 (10%)
Bi-level positive airway pressure	1 (2%)
Median pre-procedure oxygen requirement (FiO_2) (range)	0.4 (0.28–0.7)
Median post-procedure oxygen requirement (FiO_2) (range)	0.26 (0.21–0.45)
Median dose of surfactant, mg/kg (range)	200 (107–308)
Comfort	
Premedication (atropine and fentanyl)	29 (58%)
Non-pharmaceutical (swaddle±sucrose)	21 (42%)
Use of videolaryngoscope	30 (60%)
Team member performing LISA	
Tier 1 (ST1-3/SHO)	16 (32%)
ANNP/ACP	10 (20%)
Tier 2 (ST4-8/Registrar)	21 (42%)
Consultant	3 (6%)
Procedure taken over by a more senior colleague	7 (14%)
Adverse events	
Apnoea requiring positive pressure ventilation	7 (14%)
Technical difficulties requiring >2 attempts	3 (6%)
Bradycardia	2 (4%)
Mild trauma	2 (4%)
Pneumomediastinum	1 (2%)
Minor pulmonary haemorrhage	1 (2%)
Failure (requiring intubation within 48 hours post-LISA or inability to perform LISA procedure)	10 (20%)
Late intubation	8 (16%)
Technical	2 (4%) converted to intubation
Babies requiring a second dose of surfactant	5 (10%) (all via intubation, not LISA)
Chronic lung disease (oxygen requirement at 36 weeks' corrected gestational age)	8/45 (18%)*

*Babies >34 weeks excluded.

†Recorded 1–2 hours post-procedure.

FiO_2, fractional inspired oxygen concentration; LISA, less invasive surfactant administration.

The updated regional guideline (available as online supplemental file) states that LISA should be considered for babies <33 weeks, in ≥30% oxygen. We continue to refine the optimum patient characteristics as new evidence is made available.

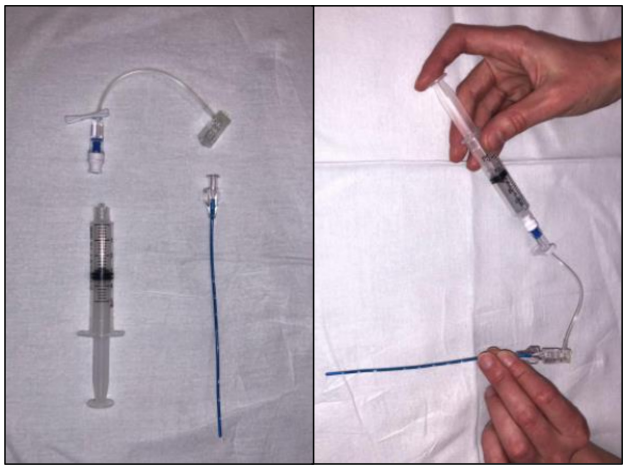

Figure 2 T-piece extension kit attached to the LISAcath.

Based on the previous routine unit practices, the majority of the babies in this cohort would have been ventilated to receive surfactant. The improvement measure is a short-term reduction in ventilator days, which may consequently reduce long-term BPD rates. However, with confounding respiratory support trends like increasing high-flow use and small numbers in our cohort, it may take a few years to see this impact.

Using a prospective data collection for each LISA episode may allow adverse events to be better characterised.

In the future, we aim to perform LISA on delivery suite as part of initial stabilisation. This will require widening staff education, reviewing equipment and using simulation to identify additional challenges.

Acknowledgements Thank you to the Bedside Clinical Guideline Partnership in association with the West Midlands Neonatal Operational Delivery Network for providing the regional guideline on Less Invasive Surfactant Administration (available as online supplemental file).

Contributors All authors have equally contributed to the design and implementation of the quality improvement project and co-written the report.

Funding The authors have not declared a specific grant for this research from any funding agency in the public, commercial or not-for-profit sectors.

Competing interests None declared.

Patient consent for publication Not required.

Provenance and peer review Not commissioned; externally peer reviewed.

Data availability statement All data relevant to the study are included in the article or uploaded as online supplemental information. All relevant data are included in the study. Any further requests should be directed to the authors.

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